



UNIFORMED SERVICES UNIVERSITY
OF THE HEALTH SCIENCES

Extraaxial Neoplasms

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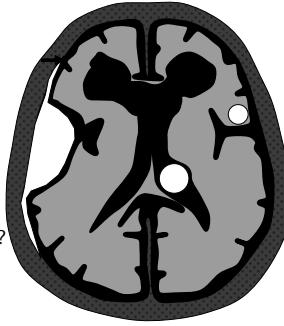
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PATTERN ANALYSIS: Location

Basic Approach

- Where is the lesion ?
 - Intraaxial
 - Extraaxial
 - Intraventricular
- Where is the lesion ?
 - Supratentorial
 - Infratentorial
- How old is the patient ?
 - Child
 - Adult
- What about Sex?



Extra-axial ~ Non-Glial

- Meningioma
- Hemangiopericytoma
- Schwannoma
- Pituitary
- Pineal
- Cysts
 - Epidermoid, Dermoid
 - Colloid
 - Arachnoid



Meningeal Tumors: WHO Grades

- 91% of Meningioma - Grade 1
 - Includes most subtypes / metaplastic changes
 - Transitional, fibroblastic, meningotheelial
- 8.3% are ATYPICAL Meningioma - Grade 2
- HEMANGIOPERICYTOMA – Grade 2/3
- PAPILLARY Meningioma - Grade 3
- <1% are ANAPLASTIC Meningioma - Grade 3

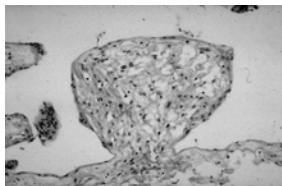
Sandhyamani, Rao, Nair, Radhakrishnan: Atypical Meningioma: A Clinicopathological Analysis.

Neurology India 2000; 48: 338-342

Meningiomas

Cell of Origin

- Dural Fibroblast ? – No
- Arachnoid Cap Cell
 - "meningotheelial cell"
 - arachnoid granulations
 - dural sinuses
 - Sup. Sag.
 - Sphenoparietal

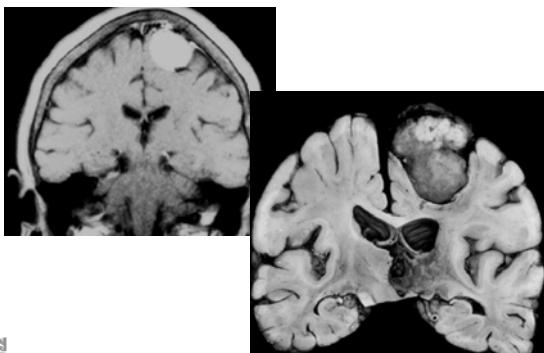


Meningiomas

- 1/7 to 1/4 of all Intracranial Primary
 - ~ 6/ 100k / year
 - small ones in ~ 1.4% of autopsies
- 1/4 – 1/3 of all Intradural Tumors
- Middle age (40-60) Your current Age + Ten Years
- Female > Male
 - Cranial 2-4:1
 - Spinal 4-8:1
 - Progesterone receptors in 66–88%
 - Estrogen receptors less common 20-40%

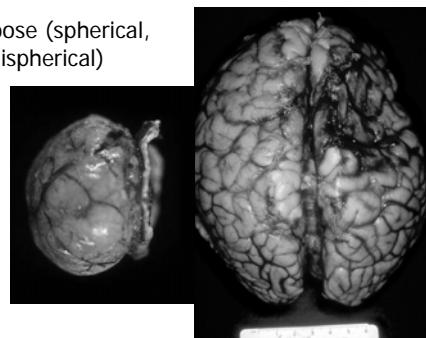


Meningioma



Morphology

- Globose (spherical, hemispherical)



"En plaque" Meningioma

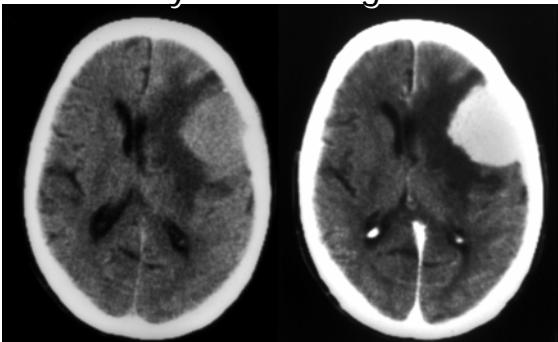
- en plaque (like a flat bread)
- Pancake
- Crepe
- Wonton wrapper
- Tortilla
- Arepa (Colombia)
- Pita (Greece and Middle East)
- Lavaash (Farsi/Iranian)
- Naan (India)
- Injera (Ethiopia)
- Bolo de milho (Brazil)



Meningioma: CT Imaging

- Non-Contrast
 - **Sharply Circumscribed**
 - Homogeneous
 - **Hyperdense (+/- Ca⁺⁺)**
 - NOT from psammoma bodies !
 - Broad Dural Surface
 - **Bone Changes (Hyperostosis)**
- Enhanced CT
 - Homogeneous Enhancement

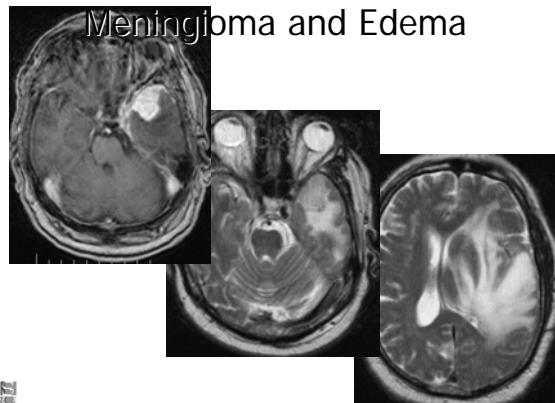
Early CT: Meningioma



Meningioma: Vasogenic Edema

- **VASCULAR**
 - parasitization of MCA, etc.
 - compression of cortical aa./vv.
- **COMPRESSIVE TRAUMA**
- **SECRETORY EFFECT "Evil Humors"**
- **"TRANSCORTICAL FLOW"**
 - Close apposition of tumor to brain
 - Thinned cortex
 - +/- infiltration of brain
 - Fluid gradient from meningioma into brain

Meningioma and Edema

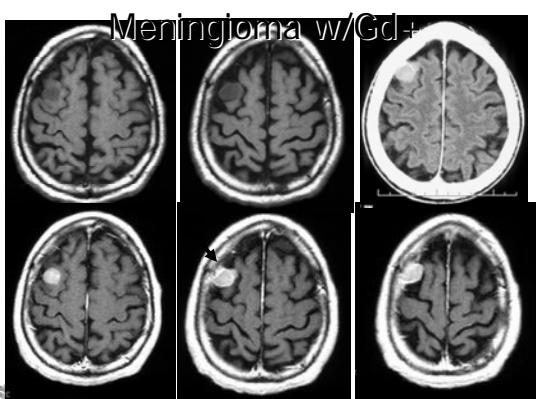


Edema and Prognosis

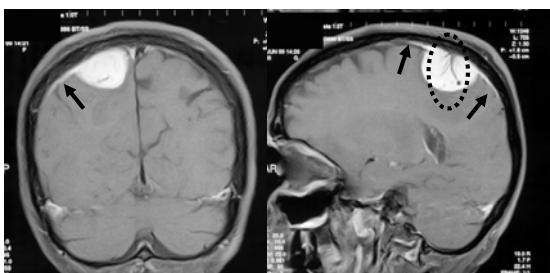
- Edema =/= Histology
- Edema =/= Size
- Edema =/= Vascularity
- Edema IS Related to Resectability
 - Smaller "pseudocapsule"
 - Surgical "cleavage plane"
 - Tumor "sticks" to underlying brain
- Resectability IS Related to Prognosis
- Edema IS INDIRECTLY Related to Prognosis



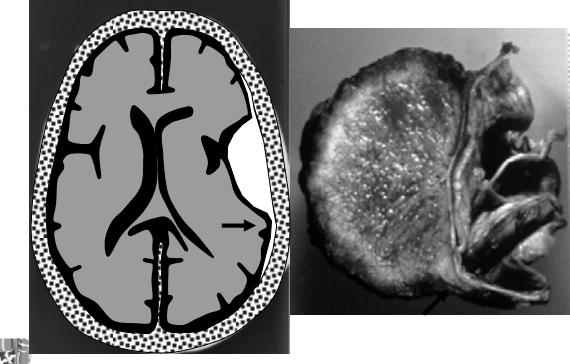
Meningioma w/Gd+



Meningioma - Dural Tail



Meningioma - Dural Tail



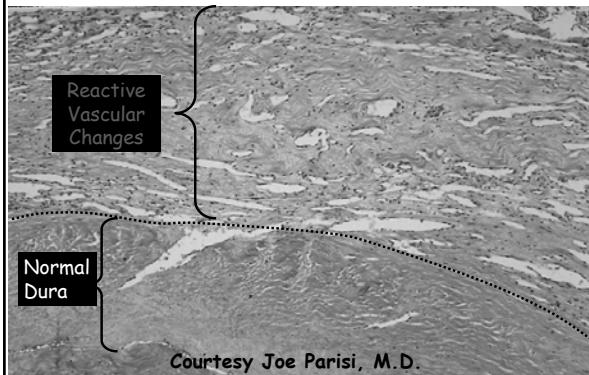


Dural Tail

- Curvilinear enhancement
- "dural flair"
- First reported w/meningioma
- First reported to be neoplastic invasion

- What is it REALLY?
 - Thickening of the dura
 - Vasocongestion of the dura
 - Edema of the dura

Dural tail: Histology



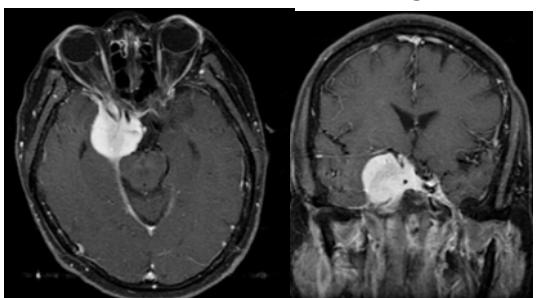
Prevalence of "dural tail sign"

- Rokni-Yazdi H, Sotoudeh H. Eur J Radiol. 2006 Oct;60(1):42-5.
- 22/98 patients (22.44%) of intracranial masses had "dural tail sign"
 - 18 meningiomas
 - 2 pituitary adenomas
 - 1 primary cerebral lymphoma
 - The "dural tail sign" had a sensitivity of 58.6% and specificity of 94.02% in diagnosis of meningioma.

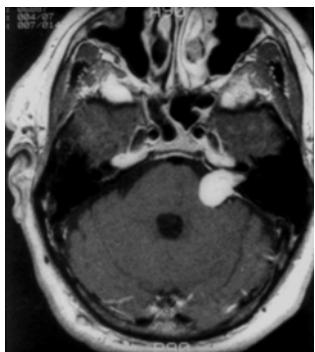


Rokni-Yazdi H, Sotoudeh H. Eur J Radiol. 2006 Oct;60(1):42-5.

Cavernous Sinus Meningioma



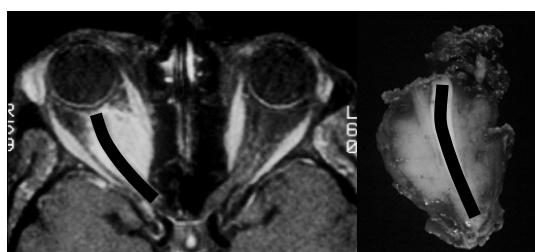
Dural Tail - Schwannoma



Other Locations for Meningioma

- Intraventricular
- Orbit
 - Intraconal
 - Periorbital
- Nasal Cavity

Optic Nerve Meningioma

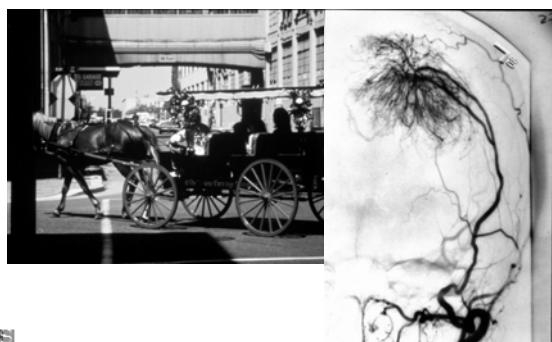


Miller (Wilmer Eye) Suggests Conservative Management
J Neuroophthalmol. 2006 Sep;26(3):200-8.

Meningioma Angiography - Supply

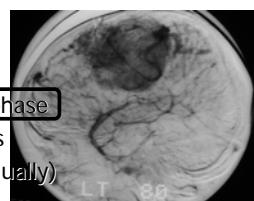
- External Carotid 85%
- Internal Carotid 63% } Some have dual supply
- Tumor Blush 95%

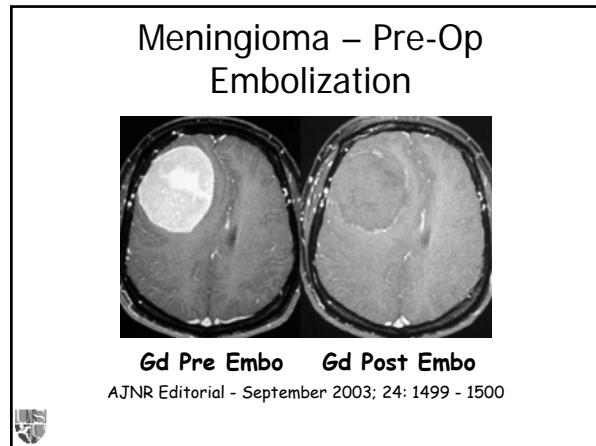
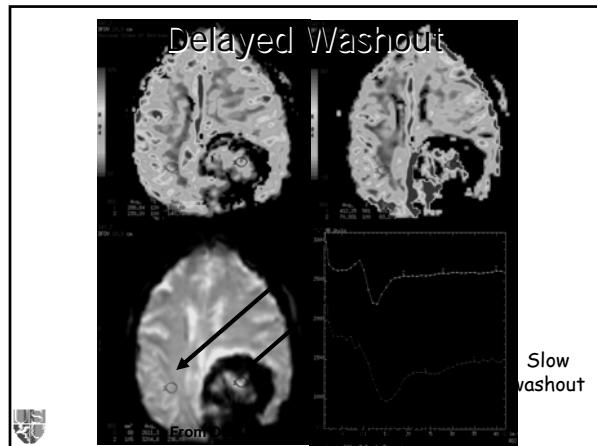
Spoke Wheel Vessels



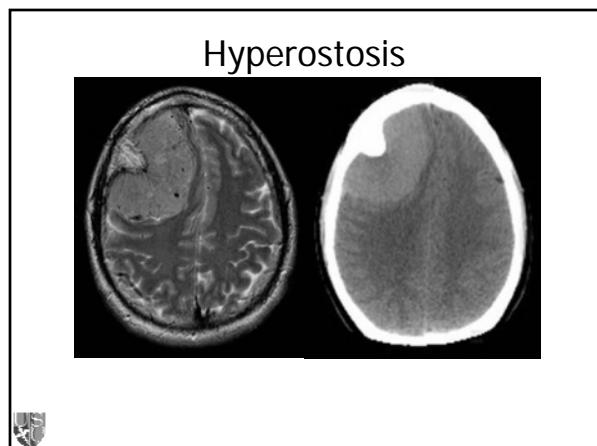
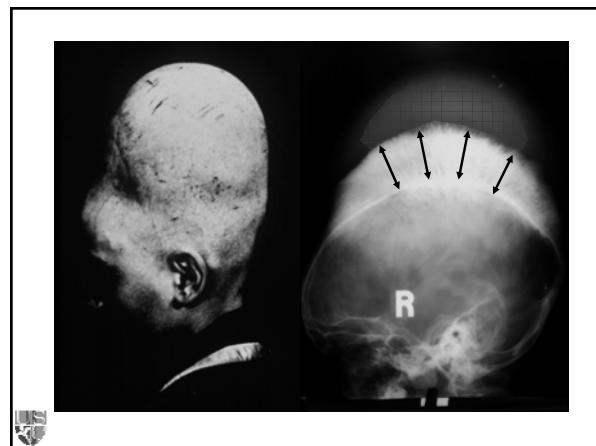
Meningioma Angiography Transit Time

- Blush or Stain
 - early arterial
 - prominent in VENOUS phase
 - capillaries/sm. arterioles
 - (too small to see individually)
- Venous Filling
 - characteristic if delayed
 - may fill with or before NI. veins





- Meningioma Effect on Skull**
- Hyperostosis (15-25%)
– w or w/o micro invasion
 - Pressure Erosion
– Periosteal remodeling
 - Bone Destruction
– microscopic invasion



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- Pineal
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 - Colloid
 - Arachnoid



"Malignant Meningioma"

- < 3% of all Meningioma
- Anaplastic (Malignant) Meningioma
- Papillary Meningioma
- "Benign" Metastasizing Meningioma
- Hernangio-Peri-Cytoma (HPC)
- Malignant Fibrous Histiocytoma MFH

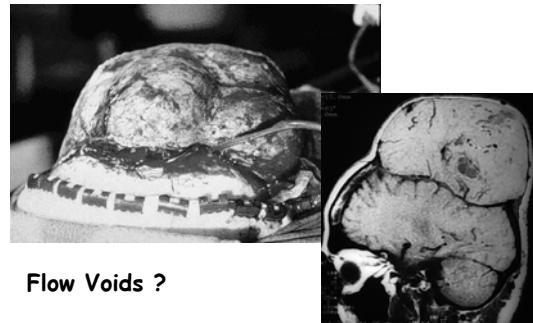


Hemangiopericytoma

- Syn: "angioblastic meningioma"
- Cell of Origin – perivascular pericyte of Zahn and/or Zimmerman
- WHO 2-3
- < 1% of primary CNS
- M 1.4:1 F
- Age – 40's
- Dural based, bone destruction, lobulated



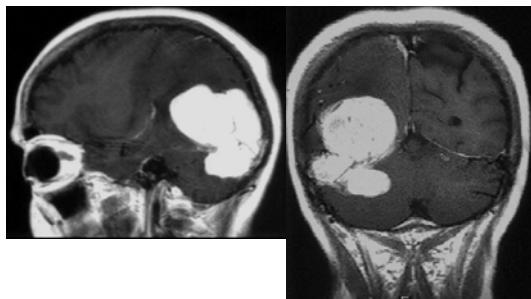
Hemangiopericytoma - HPC



Flow Voids ?



Hemangiopericytoma



HEMANGIOPERICYTOMA (HPC)

- Narrow dural base ("Mushrooming")
- No Hyperostosis
- No Calcification in tumor
- Lobulated (not hemispheric)
- Internal Signal Voids (on MRI)
 - irregular and multiple
- Hypervascular on Angio
 - irregular patterns



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SCHWANNOMA

- 5-10% of All CNS Tumors
- Benign, Slowly growing
- F > M (Intracranial), M > F (Spinal)
- 30's - 60's, w/NF-2 10's - 30's
- Sensory Nerves (usually):
 - CNN VIII (Sup.Vestibular), V, X
 - Spine: Dorsal Roots
- Majority (>90%) are Sporadic
- Multiple in NF-2, Bilat.VIII Pathognomonic



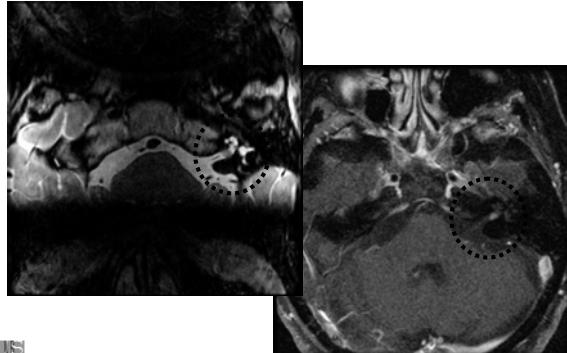
Vestibular Schwannoma



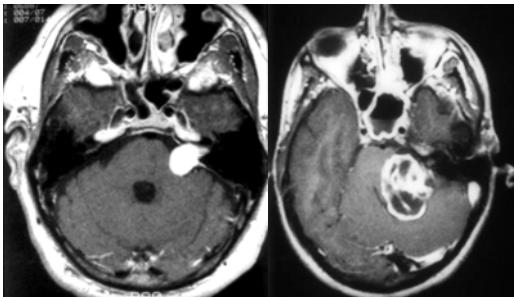
- IAC origin
 - IAC involved
 - IAC Enlarged (70%)
- Spherical Mass
 - encapsulated
- Heterogeneous if large
 - > 20 mm
- Enhance "always"



Intracanalicular Schwannoma



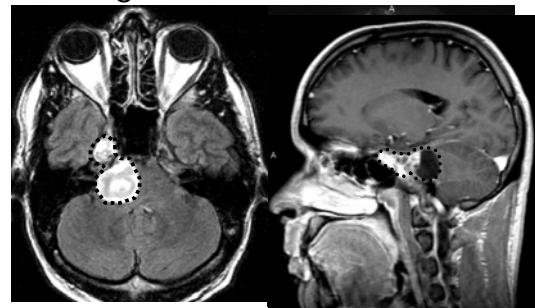
Young Schwannoma – Old Schwannoma



Benign Cystic Degeneration



Trigeminal Schwannoma



Jacqueline A. Bello MD

Extra-axial ~ Non-Glial

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DERMOID/EPIDERMOID

True Cysts "Inclusion Cysts"

Lined by an
Epithelium

•MYTH OF THE MESODERM

- One germ cell layer = epidermoid
 - Ectoderm
- Two germ cell layers = dermoid
 - Ectoderm and Mesoderm
- Three germ cell layers = teratoma
 - Ectoderm, Mesoderm, Endoderm



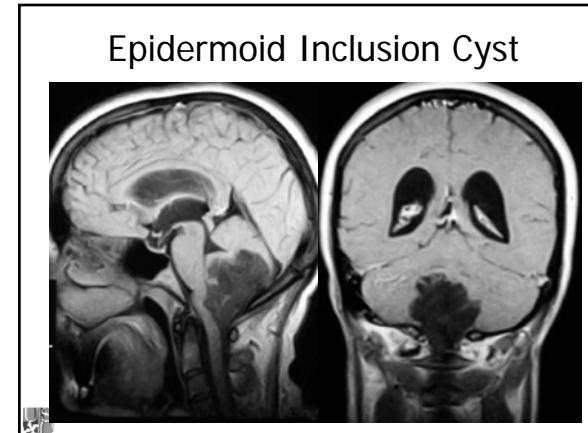
DERMOID/EPIDERMOID

Histology

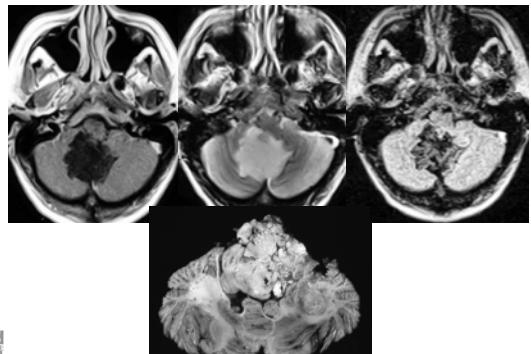
1. Epidermoid – Squamous Epithelium - ONLY
2. Dermoid – Sq. Epi. PLUS Dermal Appendages (hair, sebaceous, sweat glands, etc.)
3. Teratoma – Complex tissues, 2 or more germ layers (often mainly ectoderm, "benign cystic")

EPIDERMOID

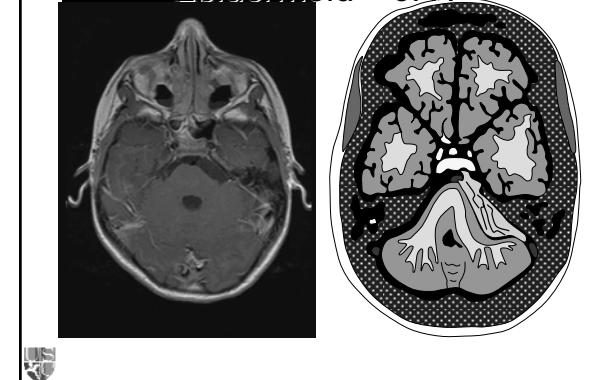
- AGE: 4 – 6TH Decade
- Location: Midline or lateral (CPA)
- Composition: Sq. epithelium, keratin
- Thin wall, no Ca++ or Vascularity
- NCT: Lipid to Brain
 - Ca++/enhance. Rare
- MRI: Hetero., CSF to Brain
 - NOT bright on T1W
 - ** Fluid/Fluid Level RARE
 - Restricted Diffusion or T2 "shine through"



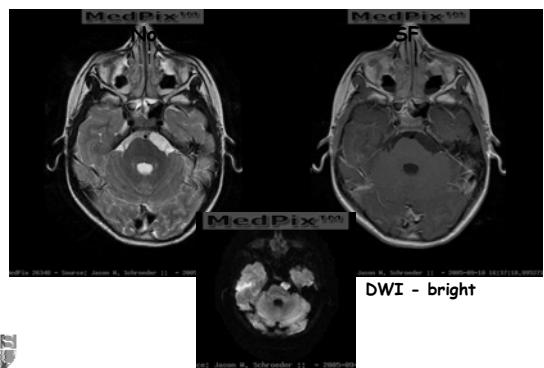
Epidermoid Inclusion Cyst



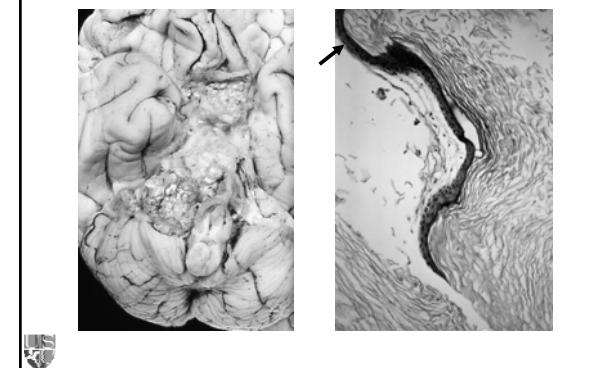
Epidermoid - CPA



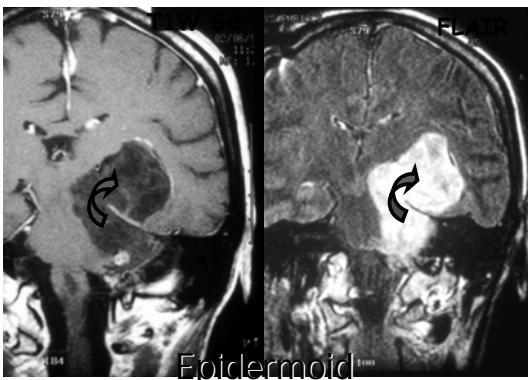
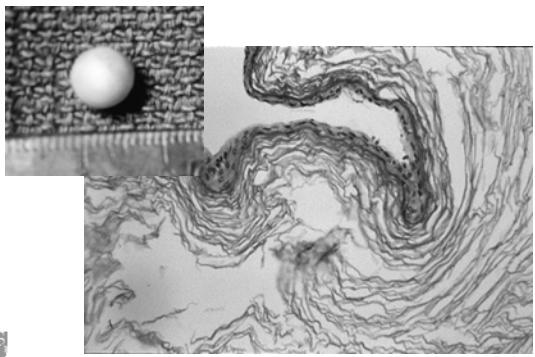
CPA Epidermoid Cyst



CPA Epidermoid – “pearly tumor”



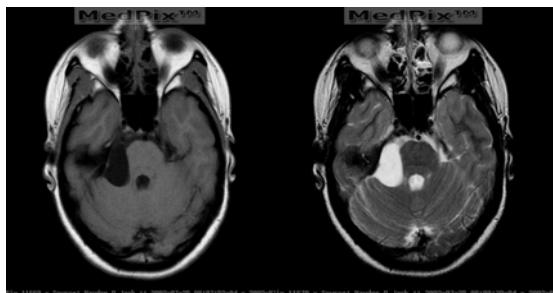
Epidermoid - Dry Keratin



Epidermoid vs. Arachnoid Cyst

- Epidermoid Inclusion Cyst
 - CPA most common
 - Extraaxial CPA Lesion
 - IAC Normal
 - Undulating Margin
 - CSF - 'like'
 - Not identical - NO Enhancement
 - Wispy internal structures
- Arachnoid Cyst
 - Middle fossa common
 - Extraaxial CPA Lesion
 - IAC Normal
 - Rounded Mass
 - Identical to H₂O on CT and all MR sequences
 - T1, PD, T2, FLAIR, DWI, ADC
 - NO Enhancement
 - NO 'structure'

Arachnoid Cyst



NOTE: Signal higher in cyst, less dephasing from CSF pulsation.

DERMOID

- AGE: 3rd Decade
- Location: Midline
- Composition: Sq. epi. & appendages
- Thick wall, Ca++ & Vascularity
- NCT: Lipid to Brain, Fluid/Fluid
 - Ca++/enhance. Often
- MRI: Heterogeneous, Lipid to Brain
 - Bright on T1W
 - ** Dysraphism, Sinus tract

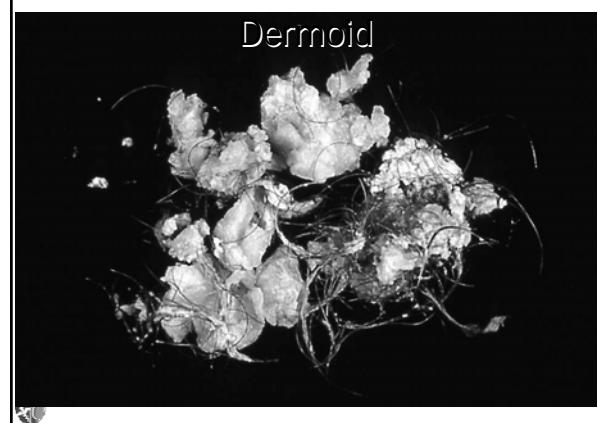
Dermoid - Spa or Salon Tumor

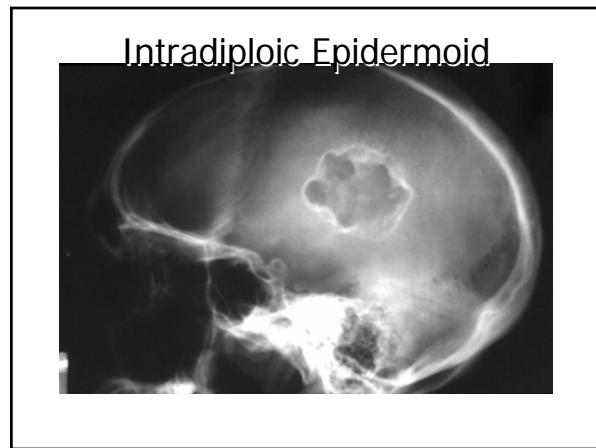
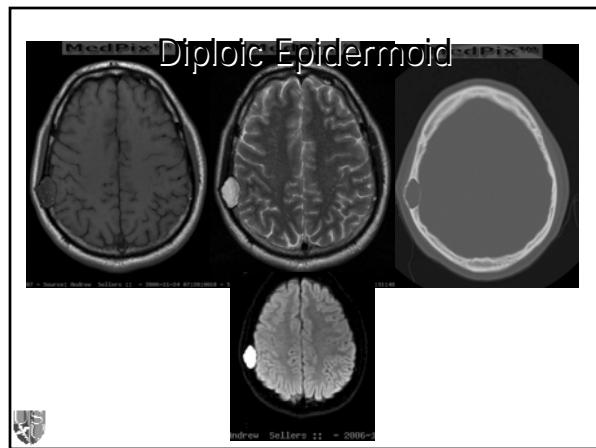
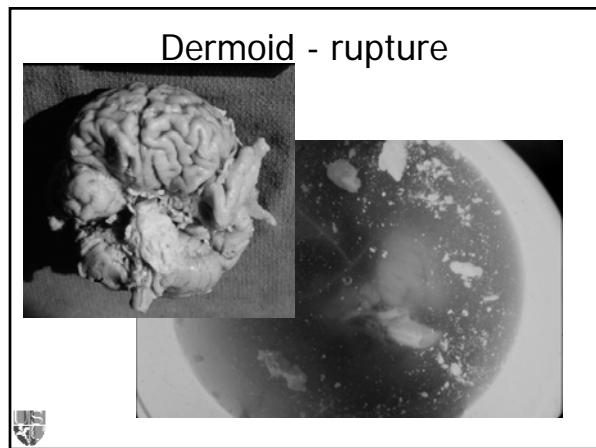
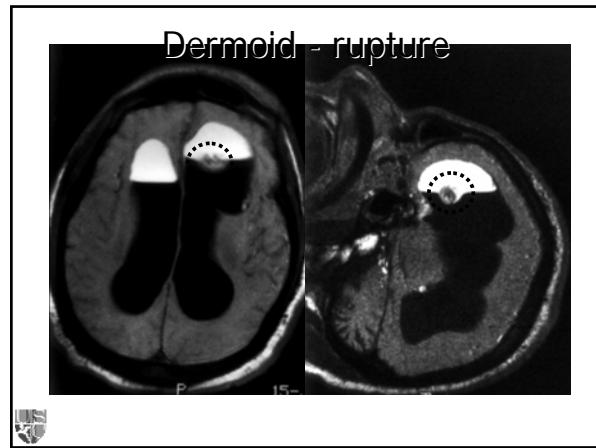
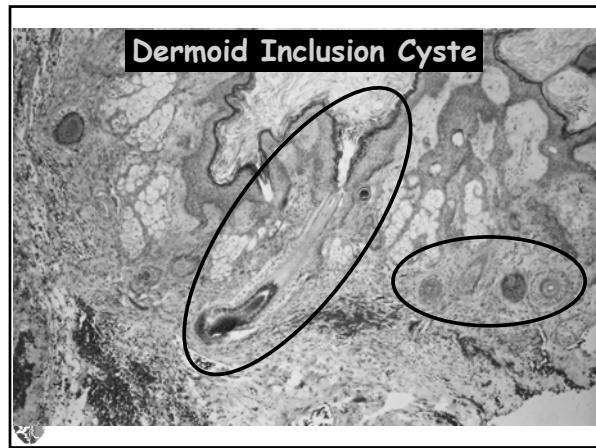


Dermoid Inclusion Cyst



Dermoid

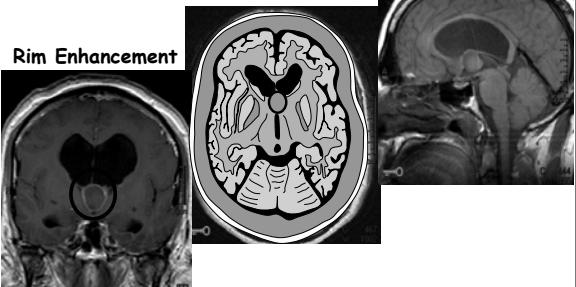




COLLOID CYST

A benign mass,
in a Malignant Location.

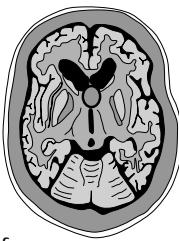
36 year old with cardiac arrest



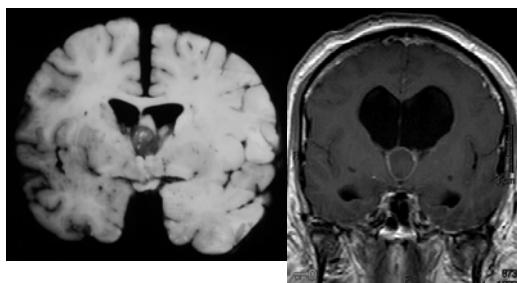
Courtesy Doug Phillips, UVA

COLLOID CYST

- Location: Foramen of Monro
- CT: sharply demarcated
 - hyperdense to hypodense
 - << half enhance
- MR: sharply demarcated
 - T1W – iso. to bright
 - T2W – bright to dark
 - Gd - Rim Enhancement
 - NOTE: Dark Cysts are too thick for Stereotactic Aspiration

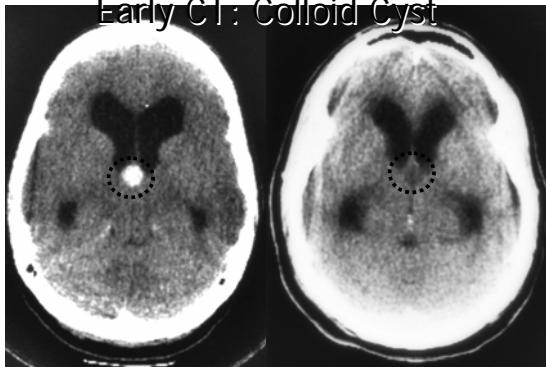


Colloid Cyst



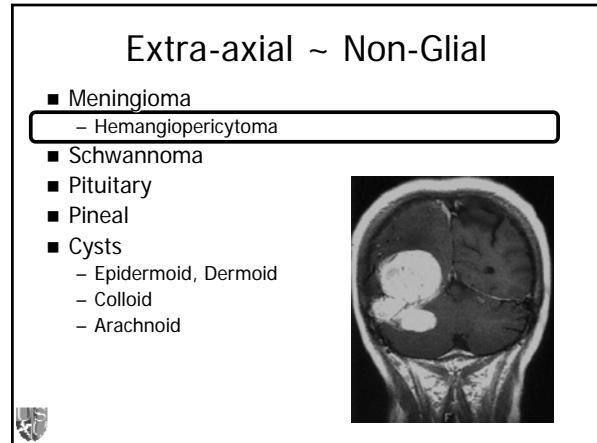
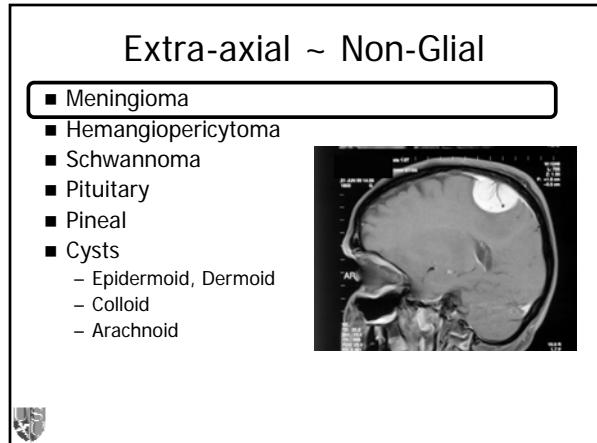
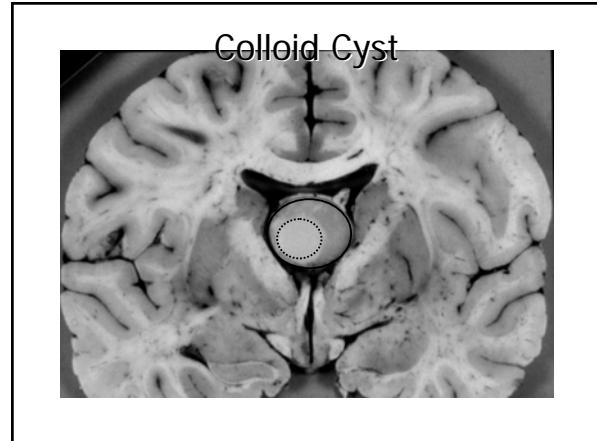
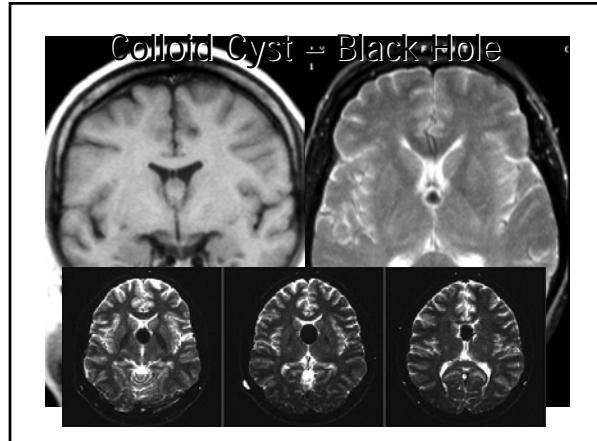
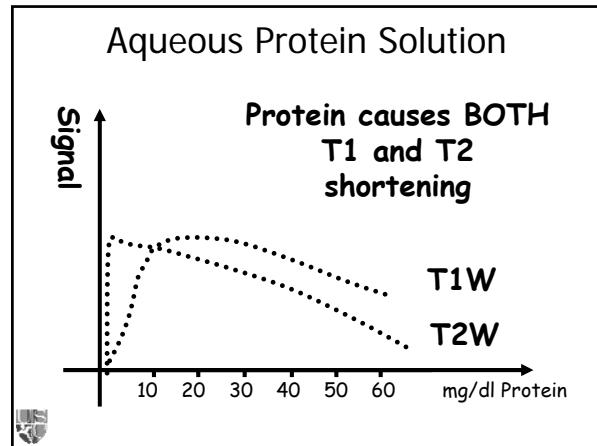
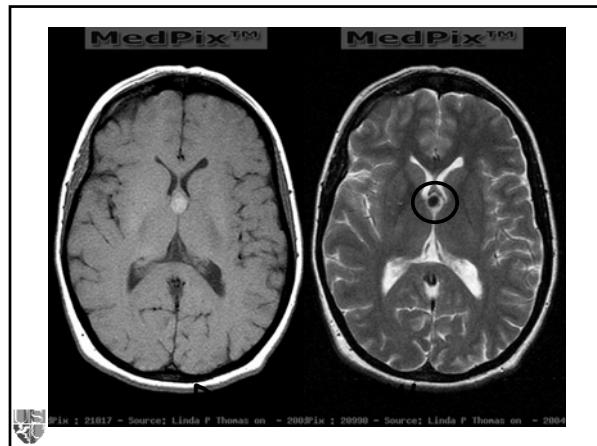
Courtesy Doug Phillips, UVA

Early CT: Colloid Cyst



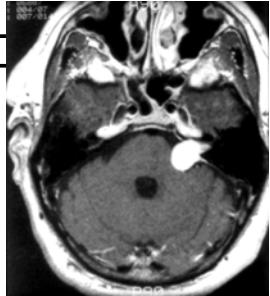
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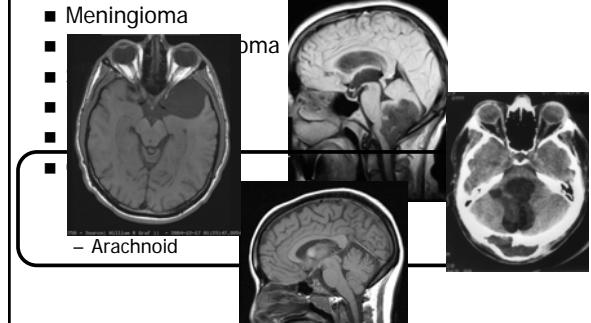
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Go Raith Maith Agat
Thank You!

Muito Obrigado

EΥΧΑΡΙΣΤΩ !

Mahalo !

Dank u wel !

Merci Beaucoup

Danke Schön !

Mil Gracias



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